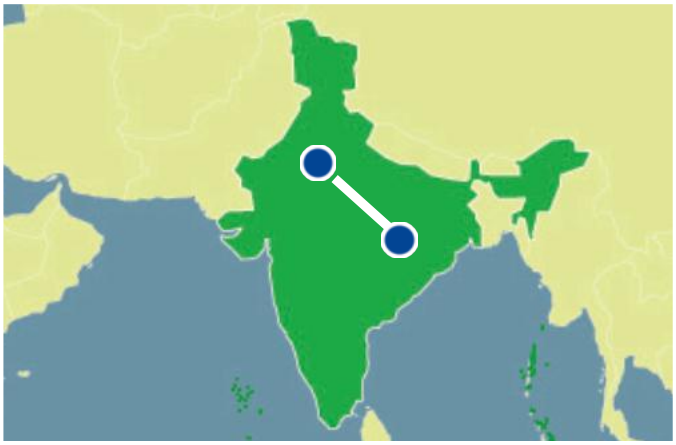
GE
Grid Solutions

Champa ±800 kV HVDC

Delivering Efficient Energy Highways in India

In 2012, GE was awarded a turnkey project for the transfer of 3,000 MW from Champa in central India to Kurukshetra in northern India, using 800 kV HVDC technology.

Imagination at work



1365 km energy highway to connect Champa with Kurukshetra

Project Overview

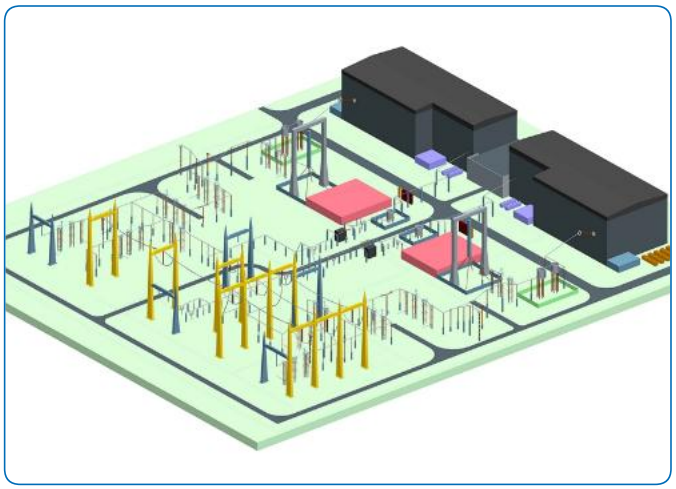
Country:	India
Project:	Champa-Kurukshetra HVDC interconnection
Customer:	Power Grid Corporation of India Ltd (POWERGRID)
Technology:	High Voltage Direct Current (HVDC), Line Commutated Converter (LCC)
Scope:	Turnkey ±800 kV HVDC
Ratings:	3,000 MW, ±800 kV
Commercial Operation:	2017: Champa Phase I
	2018: Champa Phase II

Customer Challenges

Power Grid Corporation of India, Ltd (POWERGRID) is India's central transmission utility. POWERGRID is a technology leader utilizing Extra High Voltage Alternating Current (EHVAC) and High Voltage Direct Current (HVDC) transmission systems.

POWERGRID carries approximately 50% of all generated power across India, with 95,329 km of transmission lines and 156 EHVAC and HVDC substations (July 2012). Indian power generation capacity has grown 50% in the last five years. Meanwhile, the country's transmission capacity has only grown 30%, with significant new bulk power transfer requirements for growing regions in the north, south and east of the country.

POWERGRID's latest project is the most challenging yet. Through to 2017, many independent power projects will be launched in the central Indian region of Chhattisgarh, with long-term power transfer requirements reaching 15,000 to 16,000 MW. Of this, around 5,000 MW of power is targeted for the northern region.

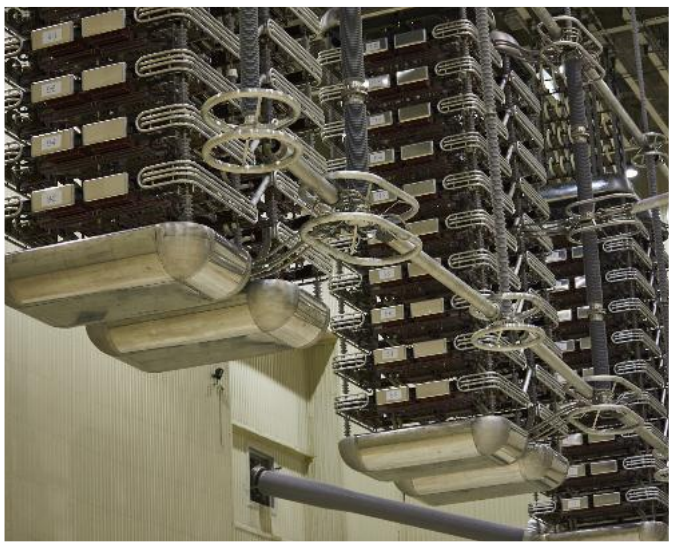


Converter station scheme

GE's Scope of Supply

Full turnkey project with civil works including:

- Thyristor valve modules, control and protection systems
- 800 kV DC switchgear (switches, isolators, surge arrestors, instrument transformers)
- 32 converter transformers
- 400/220 kV gas-insulated and air-insulated switchgear for the Kurukshetra converter station
- Substation automation digital control systems
- Telecommunications equipment, SCADA



H400 Valves at the Kurukshetra AC/DC converter station

Champa control room

The Solution

GE is to supply a ±800 kV 3,000 MW bipole to connect Champa with Kurukshetra in the north, via a 1365 km "energy highway" of clean, efficient power. This large scale transmission line will meet the needs for more power in the north – transmitted through the Kurukshetra load centre by increasing the bulk power transfer requirements in Chhattisgarh, known for its hub of independent thermal power producers.

GE will design and deliver two complete HVDC converter stations at Champa and Kurukshetra, which include thyristor valve modules and converter transformers (32 units), as well as 400/220 kV gas-insulated and air-insulated switchgear for the Kurukshetra end of the installation.

The scope of supply also includes substation automation digital control systems, telecommunications equipment and a SCADA system. The aim is to improve the quality and increase the capacity of the Indian transmission grid using Direct Current (DC) technology, which is inherently more efficient with fewer losses.

One of the 32 power transformers on its way to Champa

History

GE has played a key role in re-building and improving existing AC networks, supporting India's mission to move to ever higher voltages. Since delivering the country's first 765 kV high voltage (HV) substation to the SIPAT power plant in 2007, GE has been selected for more than half of the 40 planned EHV substations all over the country.

However, with such large power transmission requirements, AC is in many cases no longer the most efficient or practical option. India has thus taken significant steps in pioneering HVDC technology to transport bulk power over long distances.

POWERGRID is one of the most knowledgeable utilities in the world with regards to HVDC transmission systems and Supergrids. Over the last 15 years, GE and POWERGRID have worked together on three significant HVDC projects: Chandrapur (1000 MW interconnection between western and southern networks), Visakhapatnam (500 MW interconnection between eastern and southern networks) and Sasaram (500 MW interconnection between eastern and northern networks).

The Technology

Power electronics solutions – notably HVDC – are key elements to enabling utilities around the world to take control of their networks and improve their transmission systems. Strong, reliable networks rely on power electronics. Line Commutated Converter (LCC) technology is the backbone of meshed AC-DC grids, or "Supergrids" and can be used for:

- Back-to-back interconnections up to 500 kV
- Point-to-point long distance transmission (energy highways) up to 800 kV

Regardless of the source (hydro, thermal or nuclear), HVDC provides efficient and cost-effective transmission of very high levels of remotely generated power over very long distances to the load centres. Moreover, 800 kV HVDC requires four times less "right-of-way" land when compared to HVAC transmission, the typical transmission system in India, reducing both the ecological and visual impacts. HVDC solutions are more economical than HVAC for schemes with transmission distances longer than 700 km. The technology is asynchronous, meaning that it can adapt to any rated voltage or frequency and can be used to assist the AC network at each end of the link.

"Connecting people all over the world to the energy they need to live and thrive is our purpose at Grid Solutions. When we help turn the lights on for the India's Northern region, we are improving the lives of over half a billion people. We are proud to have partnered with Power Grid to deliver and commission this brand new 800 kV UHVDC connection for India,"* said Reinaldo Garcia, president and CEO, Grid Solutions from GE Power.

46% of 1.2 billion people is equivalent to 552 million people

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